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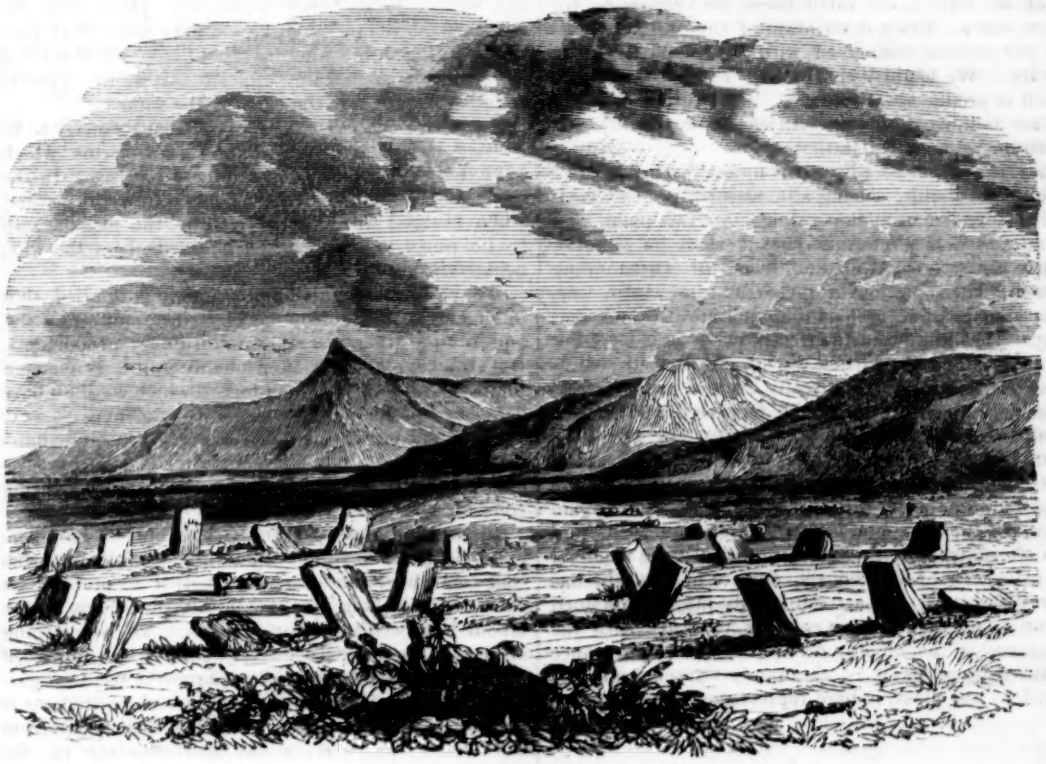
DARTMOOR, DEVONSHIRE.



THE GRAY WETHERS, DARTMOOR.

..... A holy peace
Pervades this moorland solitude—the world,
And all who love that world, are far away!—CARRINGTON.

DEVONSHIRE is one of the most picturesque and romantic portions of our island. Its natural scenery, both maritime and inland, is of the highest order; and combines every variety that can either charm the eye or interest the imagination. The tourist may trace the mountain torrent from its source, brawling over a wild and rugged channel through rocky glens or moorland wastes; or behold it gently meandering through some luxuriant valley, where its fresh and limpid waters diffuse life and loveliness over the softened landscape;—the antiquary may ponder over ruined castles, and mouldering fanes, with their shattered arches and crumbling cloisters, the relics of a former age, or recognise the remnants of a still more remote period, in the semblance of moss-grown cromlechs and fallen columns.

The central part of the western district, extending from the vale of Exeter to the banks of the Tamar, chiefly consists of the very remarkable region called DARTMOOR, a district distinguished in a striking degree from any other in England, and of which we purpose to lay before our readers as full and popular an account as is compatible with the space of the *Saturday Magazine*.

This great "Devonshire Wilderness," or "wild morisch or forest ground," as it is called by Leland, is about twenty miles in length, and of an average breadth of about eleven; stretching in a line from east-north-east, to west-south-west. It contains, according to the latest authority, a superficies of 130,000 acres, affording only a scanty pasturage to sheep and cattle.

The external aspect of this interesting district is extremely wild and dreary, presenting an almost endless continuation of lofty hills, craggy rocks, and narrow valleys strewed with enormous masses of granite, which some convulsion of nature in by-gone days has probably severed from the surrounding eminences. Indeed, innumerable masses of stone of various dimensions lie scattered over the general surface of the Moor, and those which lie on the sides of the hills, are moulded into the wildest and most impressive forms imaginable. Some of these heights rise abruptly into peaks, crowned with huge piles of stone, and are called "Tors." To a person standing on one of these lofty points, the surrounding country wears the appearance of an irregular broken waste, which may be best compared to the long rolling waves of a tempestuous ocean, fixed into solidity by some instantaneous and powerful impulse. Gilpin, in his work on the western parts of Devon, in allusion to this, says that, "Dartmoor spreads like the ocean after a storm, heaving in large swells." Even at a distance, this desolate wilderness has the same billowy

aspect, which in every zone, according to Humboldt, is the prevailing feature of primitive formations.

During the season of Winter, the Dartmoor hills are generally enveloped in fogs and vapours, through which the sun with difficulty penetrates; but in fine weather, their hue is liable to a constant change from sombre gray to a deep azure, owing to the state of the atmosphere, and the alternations of light and shade. One of the most striking features in this dreary region, is the almost total absence of trees and dwellings. An intelligent writer in alluding to this, says, "There is on Dartmoor a stillness, a want of life and activity, and a lofty dignity of expression in its black and barren pastures, which can only be seen in similar ranges of uncultivated lands."

From the numerous remains of round houses—standing singly, but more or less near each other, built in the most primitive manner of unwrought stones without cement, varying in diameter, the largest not exceeding twelve feet—there can be no doubt that Dartmoor and its borders in the early ages were rather thickly inhabited. These edifices are attributed to the ancient Britons; indeed, we have partial confirmation of the surmise from Cæsar, who says that the houses of the Britons were built singly; and the Rev. Mr. Fosbrooke, in his learned dissertation on British Antiquities, gives a representation of a dwelling of this people, which corresponds with the remains on Dartmoor.

There are also several Druidical or Celtic remains on the Moor, as the circles, the logans, and the rock basins abundantly testify. At Drewsteignton, there is a very remarkable logan, or rocking stone, in the rocky channel of the Teign river, but its oscillating powers have nearly ceased. The base or under-stone of this vast mass of granite is deeply set in a bed of rocks, of which, indeed, it forms a part. The logan stone is of irregular shape, its height, or thickness, varying from six or seven to ten feet; its length is about eighteen feet; the top flattish. When rocked, it is said to have emitted an audible murmur of a peculiarly awful nature. The scenery around this monument of a remote age, is of uncommon grandeur. There are one or two other logan stones in the same neighbourhood, but of less dimensions. The only cromlech on the Moor, is at Shilston, near Drewsteignton, which bears the name of the Spinster's Rock, from an absurd tradition that three spinsters, or unmarried damsels, constructed it one morning for their amusement before breakfast. Chappell considers this cromlech as a druidical place of judicature, or perhaps intended for astronomical purposes. On the higher part of Dartmoor are two circles called the "Gray Wethers," from their fancied resemblance, at a short distance, to sheep. They are situated directly under Sittafond Tor, and consist of thirty stones, each varying from three to five feet in height, and from seven to nine feet apart, according to their size. Not more than half of them are erect, some being thrown down, and others removed. Both circles are sixty feet in diameter. Barrows, or ancient graves, are common on several of the downs, and on Quarnell Down in particular, there is a barrow ninety-four paces in circumference. Some of these ancient places of sepulture have been opened, but only fragments of bones and urns were found.

Dartmoor gives rise to a large number of rivers and mountain-streams: the scenery on some is very peculiar, and in many respects almost unequalled in interest and beauty, particularly in the wilder and more secluded parts of the region, and in the vicinity of the coast. The principal rivers are the Dart, (which imparts its name to the Moor,) the Teign, Tavy, Taw, and Plym, which all take their rise in the northern quarter of the district, chiefly from a range of hills called Cranmere; and, with the exception of the Taw, travel southward towards the British Channel, and give their names at their embouchures, to several ports and watering-places, some of which are of considerable importance.

The numerous brooks and torrent streams of the Moor also rank among its distinguishing features. As the country is one continued slope from its highest elevation to the sea, many of the streams rush with headlong fury, along deep and shadowy ravines, mountainous elevations rising in frowning grandeur over the tumultuous waters at their feet, which, all wildness and power, hasten on to mingle with the ocean beyond, or unite with some stately river. There are in Dartmoor, or on its immediate borders, not fewer than five principal rivers, twenty-four secondary rivers, fifteen brooks, two lakes, and seven heads; or, altogether, fifty-three streams. This superabundance of water is occasioned by the spongy nature of the land, which retains the heavy showers that so frequently fall in the western counties, until the waters in the extensive morasses gradually overflow. In this manner, and from almost as small beginnings, do some of the most mighty rivers in the world take their rise, and are evidences of the many and ever bountiful provisions which the all-wise, and supreme Author of nature has furnished for the use and benefit of His creatures. The roaring of the various torrents of water in the Moor, after heavy rains, and when the wind favours the transmission of the sound, is very grand, and especially striking to those who have never heard this impressive music in this "wild and wondrous region."

One of the peculiarities of Dartmoor and the surrounding country, are the Tors, or as they are called by the native poet of the district, with a poet's license, "Mighty Tors." The word *tor* implies, in the Celtic and other languages, a beacon or fire-tower, and some of these hills were formerly used for this purpose. There are none that rise to any very lofty altitude, Rippen Tor, which is considered amongst the highest, being only 1549 feet above the level of the ocean, an elevation not greatly exceeding that of the Malvern Hills in Worcestershire.

Hey, or High Tor, is perhaps the most remarkable of the series, and when illumed by the rising sun, its rocky summits may be distinguished at an amazing distance. It consists of a double peak, or two large but separate columns, with steps cut in the solid stone for ascending each; and from the summit there is a magnificent view of the coast, stretching to the east as far as the cliffs of Dorset, and embracing on almost every point of the compass, a rich and diversified mass of heath, woods, rocks, meadows, rivers, towns, and villages. This tor is celebrated for its peat or blackwood, and the rarity of its mosses and lichens. Some of the tors are supposed by geologists to be extinct volcanoes; but this is not supported by facts, though the conical form of several might perhaps warrant that conclusion. In the seventy-fifth volume of the *Gentleman's Magazine*, it is asserted that Bren Tor, near Tavistock, has a volcanic origin; and looking at its conical form, and the porous nature of the rock which composes it, there may be some grounds for the supposition. Crockern Tor, so well known to antiquaries, at least by name, stands about a mile distant from a place called Two Bridges, in the east quarter of the Moor, of which it is considered by some to be the centre. The president, or judge's chair, part of the bench for the jurors, and three irregular steps for ascend-

ing, are still partially visible, and as an interesting relic of old British manners, and a memorial of the Saxon *Witenagemot*, or earlier parliament of the realm, must always command respect.

In the valley of the Cad, near Shaugh Bridge, rising perpendicularly from the margin of the stream, is a remarkable cliff, or mass of rock, called the *Dewerstone*. The surface is profusely overgrown with thick and variegated underwood, consisting of ivy and other parasitical plants, which spread their luxuriant foliage over its jagged and shattered front, as if anxious to bind up the wounds that time and tempest have inflicted. The view from the summit into the awful depth beneath, is very impressive.

Shaugh Bridge crosses the river Plym a short distance below the junction of that river with the Cad.

> . . . . . How oft, as noon
> Unnoticed faded into eve, my feet
> Have lingered near thy bridge, romantic Shaugh;
> While, as the sister waters rushed beneath,
> Tumultuous, haply glanced the setting beam
> Upon the crest of Dewerstone. The hawk
> Rested upon the aged cliff;—around
> A holy silence reigned;—the mountain's breast,
> Lay hushed as midnight;—not a vagrant gale
> Sighed through the woods of Plym, and on the soul
> Fell deep the impressive calm.—Carrington.

The scenery of the Plym is of extreme beauty, and ranks amongst the finest in the kingdom. In consequence of the number of rivers and streams which flow through Dartmoor, nearly one hundred and fifty bridges have necessarily been erected by the county at various periods.

A Railway between Prince Town and Sutton Pool, near Plymouth, a distance of more than twenty-five miles, was opened for public use in September, 1823, at a cost of 39,983*l.*, raised principally by the influence of Sir Thomas Tyrwhitt, who subscribed upwards of 3000*l.* towards the undertaking. The railway was projected by the same spirited individual in the beginning of the year 1818. A company was subsequently formed, and incorporated as the Plymouth and Dartmoor Railway Company. Immense quantities of granite of the finest quality are conveyed on it, and shipped for London and other large towns.

Prince Town, a small place containing about thirty houses, so called in honour of his late majesty, when Prince of Wales, is worthy of notice, as being the site of Dartmoor Prison, where, during the late war, a great number of prisoners were confined. From May 29, 1809, to April 22, 1814, no less than 12,679 unhappy victims were incarcerated there; about 1117 deaths occurred during that period, of which 1095 were French, and twenty-two Americans. This immense and remarkable structure is exceedingly well adapted for the object designed. Elevated at least 1400 feet above the sea, it comprises within its walls a circumference of thirty acres, enclosed on its eastern, northern, and southern directions, by a lofty wall, and on the western part, or front, which being straight, blunts the circumference, by two handsome residences appropriated to the agent and surgeon, and having between them a Cyclopean gateway, surmounted with the motto, "*Parcere subjectis.*"

Sir Thomas Tyrwhitt, the originator of the railway, first suggested the idea to government, and as the prisons at Plymouth had become old and inconvenient, it was determined to erect this building from the plan of Mr. Alexander. The first stone was laid in March, 1806. The edifice is principally composed of the granite so plentiful on the Moor, and was completed at a cost of about 127,000*l.* A portion of the building, comprising two of the prisons, the dwellings for the inferior officers, and the walls of the chapel and parsonage-house, were erected by French, and the interior of the chapel was fitted up by the American prisoners, who were paid a daily sum for this labour; a mode of employment which tended to alleviate the tedium of their captivity, and increase their comforts. The various parts of the prison were thoroughly supplied with excellent water from an inexhaustible reservoir filled by a branch of the river Walkham, diverted for that purpose.

The air of Dartmoor is exceedingly healthful and invigorating; one proof of which is to be found in the fact, that the "Moorsmen," as they are locally termed, are famed for feats of strength, especially wrestling. Many of the inhabitants attain a great age. The farmers lead a very laborious life in cultivating the barren lands in the vicinity of their habitations; nevertheless, they seem happy and contented with their lot, and, as is generally the case in all wild and moorland districts, they appear greatly attached to the soil which gave them birth. Many of the cottagers maintain themselves by digging peat fuel from the extensive bogs, which is chiefly sent to that district of the county termed "the south hams." Others job in cattle, and drive a humble trade in garden produce, &c.

Dartmoor, in former days, particularly when covered in a greater or less degree with wood, is said to have abounded with wolves, boars, badgers, and other wild animals. The wolf was not extinct in Dartmoor, according to Howel, even so late as the reign of Elizabeth. Wild cattle, similar to the aboriginal species preserved in Chillingham Park, Northumberland, formerly abounded. The red deer and stag have now nearly abandoned it, the former being chiefly to be met with in the north of Devon. In the time of Henry the Third the stag was common. Foxes, hares, and rabbits, are still very numerous. The moor-horse, or more properly pony, is an active little animal, but seems to be left almost entirely in a state of nature.

Some writers have supposed that Dartmoor, in the old time, was luxuriantly covered with wood, and, indeed, at various periods the trunks, branches, and roots of trees, chiefly oak and birch, have been discovered in several parts, at different depths from the surface of the ground, some even so low as six or eight feet. The wood, from its contact with the marshy soil, is black, and after exposure for a time to the sun and air, becomes exceedingly hard. The solitary remains of the forest called the Wood of Wistman, so beautifully alluded to by Carrington, as "Dreary in aspect, silently decaying," stands on a slope, near the West Dart, to the north-east of Crockern Tor. It consists of scrubbed decrepit trees, chiefly oak, scarcely exceeding seven feet in height; their branches almost destitute of foliage, overrun with moss, brambles, and other parasitical plants, exhibit a scene of uncouth and cheerless desolation. The circumference of some of these hoary foresters almost equals their height. Wordsworth truly says,—

> I looked upon the scene, both far and near,
> More doleful place did never eye survey;
> It seemed as if the spring time came not here,
> Or nature here was willing to decay.

Several laudable attempts, on a large scale, have been made at various periods to plant and improve Dartmoor, and it is extremely probable that it will be ultimately enclosed. A recent writer observes,—

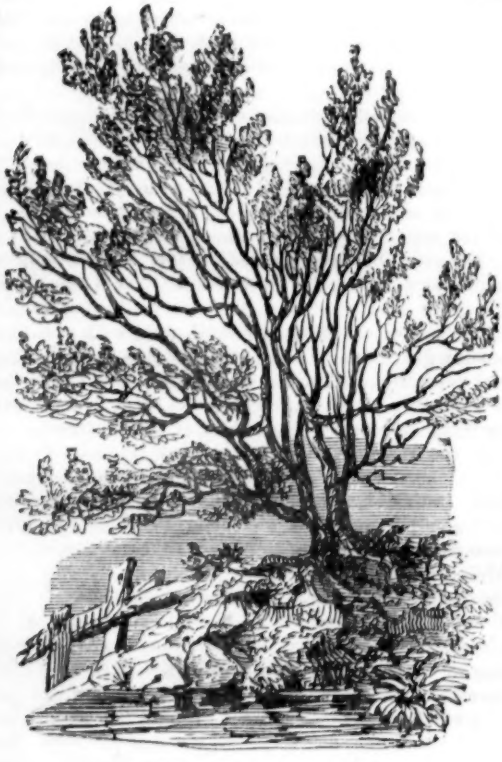
What has been effected affords a manifest proof, not only of considerable attendant advantages, but of the perfect practicability of doing more. In the wastes surrounding the moor barrenness is gradually disappearing, and softening into verdure and fertility. By judicious measures

sterility might be wholly banished, excepting where the peat earth lies immediately upon the granite rock. The soil of the neighbouring vales is of superior quality, and consists of rich friable loams; and even on the moor itself are spots forming oases, as it were, in a desert, and highly susceptible of useful conversion.

The same writer says,—

That the moor was once cultivated is evident, from the traces of furrows or ridges, and stone inclosures, still remaining upon and around it, and from the lower layers of thatch in the roofs of its old buildings being rye-straw, which probably was the grain then raised.

NOTES ON FOREST TREES. No. XXV.



THE HAZEL, (*Corylus avellana.*)

THIS well-known tree seldom exceeds twenty feet in height, and from its mode of growth and size may be called indiscriminately a small tree or a large shrub. It appears to be a native of all the temperate portions of Europe and Asia.

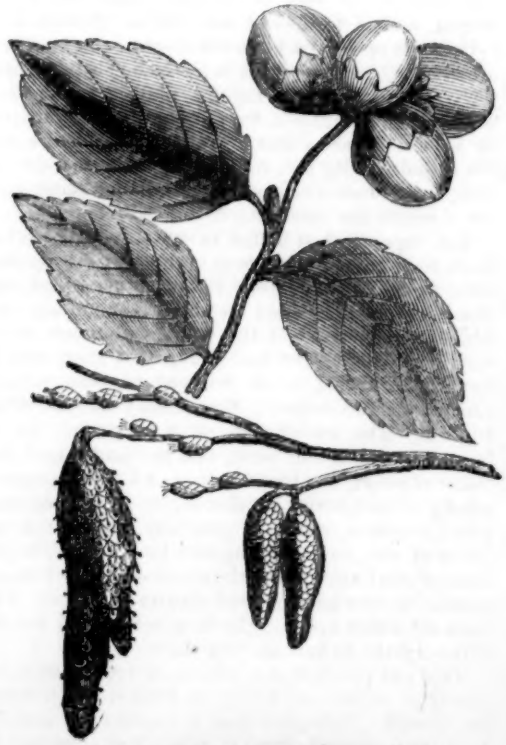
The south of Spain produces great quantities of hazel nuts, which are exported in considerable numbers to other parts of the Continent, particularly from the port of Barcelona, by which name all the Spanish nuts are known. It seems to have been looked upon by the ancients more in reference to the superstitious practices in which it was employed, than on account of its useful properties. Pliny says torches were made of its branches at marriages, the burning of which was supposed to be *lucky* to the young couple. In more recent times advantage has been taken of the folly of mankind by its employment for the purpose of discovering metals, water, hidden treasure, lost property, &c., by means of a *divining rod** formed of a twig of Hazel. The impositions that have been practised by designing persons by the aid of this instrument are almost incredible, and even at present it has not fallen entirely into disuse.

* See *Saturday Magazine*, Vol. IX., p. 36.

"The Hazel," says Sir Thomas Dick Lauder, "which, besides making up a prominent part of many a grove in the happiest manner, and tufting and fringing the sides of many a ravine, often presents us with very picturesque stems and ramifications. Then when we think of the lovely scenes into which the careless steps of our youth have been led in search of its nuts, when Autumn had begun to brown the tops of their clusters, we are bound to it by threads of the most delightful associations with those beloved ones who were the companions of such idle but happy days."

The Hazel appears to flourish in almost all descriptions of soil, but it succeeds best, and its fruit is larger and finer flavoured, in a light and moist earth. It is extremely hardy, and its blossoms appear very early in the Spring, even if the weather is severe. The stem is surrounded with numerous young shoots, which offer a very easy method of propagating the tree. But it may be grown from the seed; in this case, the nuts should be put into the ground in the Autumn, soon after they are gathered, and the young plants will appear in the next Spring. If the sowing of the nut is left until the Spring, they must be preserved through the Winter in dry sand, to prevent their becoming rancid; the trees reared in this last manner are much more vigorous, and acquire a greater height than those produced from suckers.

The fruit of the common nut is thought but little of, but the filbert, which is merely a larger variety produced by cultivation, is considered worthy of a place in the dessert. The wood of the Hazel when young is extremely flexible, and in some places it is much used in the manufacture of baskets. Nut-oil is expressed from the kernel of the Hazel nut, and is sometimes employed for the same purpose as olive-oil: it is also used by painters in oil colours, but the greater proportion of oil sold for this purpose as nut-oil, is merely a refined linseed-oil.



LEAVES, CATKINS, AND FRUIT OF THE HAZEL.

ON WRITING MATERIALS.

No. V.

The Manufacture of Writing-Paper.

In our last article on this subject, we gave a general description of the different kinds of paper, and a short account of their history, and of their introduction into this country. We shall now describe the modes of manufacturing this useful article in England.

In this, as in almost every case, the earlier specimens were produced by a greater share of manual labour than is employed at present, the inventions of modern times having enabled us to substitute machinery in almost every branch of manufacture. The result of this is, that society in general is supplied with better productions, in larger quantity, and at a cheaper rate than formerly. Such is the case with the paper manufacture. Those processes which are now performed almost entirely by machinery used to be performed by hand. We will treat first of the mode of making paper by hand.

The rags of which the paper is made are sorted into different qualities, according to the kind of paper which is required. The rags are then carried in bags to the rag-house, where women cut them up into pieces three or four inches square. They sit at a table formed of wire-work, across which is placed a knife, with the sharp edge uppermost. The woman at the table takes up the rags piece by piece, removes all impurities, such as buttons, seams, &c., and cuts the rags into small pieces, by drawing them along the edge of the knife, the impurities, dust, dirt, &c., falling through the wire top of the table into a drawer beneath. At her side is placed a box, divided into several compartments, into which she throws the pieces which she has cut; different compartments being chosen for different qualities.

The rags are then examined by "overlookers" or "overhaulers," to see that the work of the cutters has been properly performed; after which the rags are put into a cylinder, called a *duster*. This is about four and a half feet in diameter, and five feet in length, and is formed of wire cloth. A door in the cylinder is opened, a hundred weight or more of rags are put in, and the door is closed. The cylinder is then made to revolve rapidly, and as the rags are whirled about within it, they are caught and separated by spokes or arms which are inserted in the axis of the cylinder. By this means, the dust and dirt are completely shaken or beaten from the rags, and passes out through the wire cloth of the cylinder.

The rags are then boiled in water, which contains from four to ten pounds of carbonate of soda and a little quick lime to every hundred weight of rags. The boiling is continued for about eight hours, after which the contents of the boiler are allowed to cool very gradually. The boiled rags are then taken to the engine-house, to be reduced to pulp, which is effected in two engines, the *washing* and the *beating* engines. The washing-engine is a trough ten feet long, four and a half wide, and two and a half deep, made of wood, lined with copper or lead, or else made wholly of cast iron. In this engine a cylinder, called a *roll*, revolves, which is generally made of a solid block of elm, two feet long and two feet in diameter. Bars of steel are fixed to the circumference of the roll, parallel to one another, and also to the axis. These bars are about thirty-eight in number, and are from three-eighths to half an inch thick.

This roll revolves on a horizontal axis, so as to come nearly in contact with a plate fixed in the bottom of the trough. This plate has a number of steel bars projecting upwards from it, which are arranged in a direction somewhat inclined to the bars on the roll, so that when the rags are drawn between the roll and the plate, the bars in the two latter act somewhat on the principle of a pair of scissors. The trough being half filled with water, about a hundred weight of rags are put in, and the cylinder is put in motion. The bars catch up the rags, carry them half round, and dash them against a curved surface, called the *backfall*, down which they are again brought beneath the cylinder. A number of small holes at the bottom of the trough carry off the dirty water, which is separated from the rags by passing through a wire cloth, which is too fine to admit the rags. The rags are brought, by the continual revolution of the cylinder, again and again between the cylinder and the plate, where they are bruised and worked down to a pulp. The bars are made blunt, as it is deemed desirable that the rags should be bruised, rather than cut, into a pulp. A constant supply of pure water is admitted to the rags in the trough.

This process of washing occupies about three or four hours; after which the pulp is allowed to flow from the trough through a six-inch pipe into the *draining-chest*, which is situated in a lower floor of the building, and which is perforated with small holes, to let the water drain off from the pulp.

The pulp is then *bleached* in one of two ways—either by exposing it to the action of chlorine, in the state of a gas; or by steeping it in a solution of chloride of lime: the latter plan appears to be the most advantageous. If the first plan be adopted, the pulp is boiled in an alkaline solution of lime for several hours, after which it is washed in clear water, to remove the solution. The water is then pressed out, and the pulp is exposed to the action of chlorine, which is procured, in leaden retorts, from sulphuric acid, sea-salt, and the black oxide of manganese. In the other method of bleaching, the pulp is removed from the draining-chest into stone bleaching-chests. About one hundred weight of pulp is put into each chest, and six or eight pounds of chloride of lime, dissolved in twelve gallons of water, are poured in. The chest is then filled up with water, or with weak liquor, which has been previously employed in the chests.

After having been steeped in the bleaching liquid about twenty-four hours, the pulp is transferred to an iron box, in which it is carried to a Bramah press, where it undergoes a powerful pressure, which forces out as much as possible of the solution from the pulp. The pulp then undergoes another process of washing, in order entirely to remove the remains of the chloride.

The pulp is then allowed to flow into the *beating-engine*, which is almost entirely similar to the washing-engine, except that the bars are sharper, so as to exert a cutting action on the pulp: it is reduced to fibres, about an eighth of an inch in length; and after being subjected to this action for four or five hours, the pulp, which is now called *half-stuff*, is allowed to flow into a large stone chest. From the chest the pulp is either ladled, or flows through a valve into a *vat*, which is a stone vessel, about six feet square and four deep, and through the middle of which a wheel revolves, in order to keep the pulp constantly stirred.

The sheets of paper are made in moulds, formed of wire-cloth, fixed upon a frame. The wire-cloth is supported by ribs of wood, laid about an inch asunder across the frame. Paper made in such moulds is called *wove* paper, because the wire is woven into a cloth; but the wires are sometimes laid side by side in one direction only, which produces *laid* paper.

A workman, called the *vatman*, has in his hand a

slight frame, called a *deckle*, which he places on the mould, in order to form a raised edge or border to the latter. He then dips the mould into the vat, and takes up a quantity of pulp, which has been rendered fluid by being mixed and worked up with water. After jerking off some of the superfluous pulp, he shakes the mould in a horizontal position, by which the pulp forms a thin layer, from which the water drains through the wire cloth. He then removes the deckle, and hands the mould to a workman, called the *coucher*, who rests it in an inclined position, to drain more completely. The coucher then places a piece of felt on a board, and turns the mould over with its face down upon the felt, by which the thin film of pulp is transferred from the mould to the felt, in a wet but slightly adhesive state. While this is being done, the vatman is moulding another sheet of pulp, which the coucher transfers as before to another piece of felt, which is placed on the last made sheet. Thus they proceed, until from four to eight quires of felts, with sheets between, are collected in one heap, called a *post*. A heavy plank is then placed upon the post, and the whole are removed to a press, where they undergo a powerful pressure, which forces out much of the remaining moisture.

The sheets are now sufficiently adhesive to be handled; so that a workman, called the *layer*, takes the felts and the sheets one by one off the post, laying the sheets in one heap, called a pack, and the felts in another. These packs are then again pressed, by which the remaining water exudes in drops. If this pressure be too long continued, the sheets adhere together, and tear one another. The sheets are then parted, and placed with their other surfaces in contact, and again pressed, in order, to remove the marks of the felt.

The sheets, being thus made, they then undergo a process of *drying*. Posts, about ten or twelve feet high are fixed at distances of about ten feet from one another, and have moveable pins inserted in them at different heights, to support spars of wood which extend from one post to another. Between each pair of these spars ropes are stretched about five inches asunder. The workman takes up three or four sheets of paper, on an instrument shaped like a T, and passing it up between the ropes, leaves the sheets hanging over the latter. This he does until all the ropes are filled. All these posts are situated in a room, called the drying-room, to which the admission or exclusion of air can be regulated by shutters, which open or close in the sides. The drying is left to be performed by the wind; or else steam-pipes are carried through the room.

The next operation is sizeing, except in some papers in which the size is introduced into the pulp. The size is made of pieces of skin or sheep's feet, or other glutinous substance, boiled to a jelly in a copper, strained, and a little alum added to it. The workman takes four or five quires of paper, and dips them into the size, taking care that the size shall penetrate between each two sheets; after which the sheets are moderately pressed, to expel a portion of the size, and are then separated and hung up in the drying-room, where they are slowly dried. In some manufactories the sizing is effected by placing the paper on a frame, which is lowered into a tub, where hot size is allowed to flow upon it. The sheets are then carried to the finishing-house, in which they are again pressed, and a number of women pick out the knots which may be in them with small knives, and separate the perfect from the imperfect sheets; after which they are again pressed, and lastly counted, and folded into quires and reams.

Those papers which are called hot-pressed are placed between two sheets of pasteboard,—paper and pasteboard being placed alternately,—and a hot iron plate being placed at about every fortieth or fiftieth pasteboard.

Such is a general outline of the mode of making paper by hand; and although improvements have been made in every part of the process, yet the above will give a general idea of the number of processes which are performed. We will now briefly describe the mode of making paper by machinery.

The pulp is prepared much in the same way in most methods, but the distinguishing characteristics are in the moulding and subsequent processes. In Fourdrinier's method, the pulp is placed in a large vat, in which are two agitators, to prevent the pulp from settling; from whence it is discharged by a sluice into a cistern, where, after being strained through a machine, to exclude knotty portions, &c., it flows upon an endless wire-cloth, which is twenty or thirty feet long, and which passes over several rollers, so that the film of pulp which streams down upon the wire-cloth travels along this extent of surface, by which it becomes tolerably equable in thickness, loses much of its moisture, and acquires a certain degree of tenacity. The wire-cloth has a shaking motion given to it during the operation, by which the separation of the water is further effected. When the pulp has arrived at the last roller on endless cloth, it passes between two rollers, and then falls on a web of felt, on which it is carried along as before, and passes with the felt between two other rollers, by which it is pressed, and is now sufficiently firm to be handled as one continuous sheet of paper.

It then passes over and between a number of cylinders which are heated from within by steam; so that after passing over about thirty linear feet of heated surface, the paper is dry. In no part of paper-making is the advantage of machinery more decided than in the rapid drying by these means. From the heated cylinder the paper is wound on a reel, surface after surface, until a great thickness is attained, which is cut into sixteen or eighteen quires by a sharp instrument; after which they are removed to the drying-loft. By these contrivances the method of dipping a mould into the pulp, and taking out a portion of it, is entirely discarded.

Another great improver of paper-making is Mr. Dickenson. In his arrangement, a cylinder covered with wire-cloth is made to revolve over and just in contact with the prepared pulp, and to take up some of the pulp in the following manner. The pulp is made to flow through a sluice, by which its quantity may be regulated, into a vessel, against the bottom of which a brass cylinder rests. This cylinder is smooth and bright inside and out, and has a number of holes bored in its surface: on the outer surface is spread an endless web of wire-cloth. When this cylinder revolves on its central axis, a portion of the pulp adheres to the wire, on account of the cylinder dipping into the vessel in which the pulp is contained. Before this stratum or film is received on a felt, or drying-web, it is deprived of nearly all its moisture by a very peculiar process. One portion of the inside of the cylinder is enclosed into the form of a box, or chamber, which does not revolve, and which is connected with the receiver of an air-pump. When the receiver is exhausted of air, the chamber becomes likewise nearly exhausted, so that when that portion of the surface of the cylinder which contains the pulp passes over this vacuum, the external air presses the pulp so closely to the wire, that all the water is driven through into the

interior of the cylinder. It is for this purpose that holes are left in the substance of the cylinder, that the vacuum within may act upon the pulp which is spread on the wire-cloth on the outside.

All these after-contrivances, such as the vacuum, &c., are to facilitate the drying of the pulp. Directly after the film of pulp has been thus dried, it is then taken off by an endless band of felt which passes over another cylinder, and is pressed between two rollers, much in the same way as we described in Fourdrinier's method. The water which flows from the pulp through the wire-cloth, into the hollow of the first cylinder, is carried off by means of a pipe, which acts, as the axis round which the cylinder revolves; and as this water frequently contains a small quantity of pulp, arrangements are made for conveying that pulp back again into the vat.

One of the great advantages of machine-made paper, is the large size which can be given to the sheets. A sheet of paper for a double number of the *Times* newspaper, if made by hand, would require a mould of most unwieldy dimensions, and would be in every respect difficult to work. Paper-hangings have been greatly reduced in price, by being made in one piece twelve yards long; whereas small sheets had to be pasted together, under the old system.

Such are the modes now adopted for making paper. In some parts of the Continent, the rags are still reduced to a pulp in the original mode of stamping or beating. They have mortars cut in solid oak, the cavity being two or three feet in diameter, and a hole in the middle of the cavity being left to carry away the water. Large hammers with teeth act perpendicularly in these cavities, and cut the rags to small pieces. This rude method is, however, almost exploded at the present day.

INTEMPERANCE.

FRESH is fair beauty's cheek, and bright
Within the festive room,
Yet may not brook the morning light,
When night has brushed its bloom.
And bright is valour's mailed vest,
Yet soiled in nightly jar;
It may not bear with ruffled crest
To meet the morning star.
But more unseemly is the view,
When morning beams are poured
On signs of revelry, that strew
The late carousal board.
And still unseemlier than the signs,
On that foul board you trace,
Are the deep-drawn inveterate lines,
That mark the reveller's face.
The brow with clammy moisture spread,
The beating pulse, the languid head,
The cheek's pale glow with wrinkles hid,
The bloodless lip, the heavy lid,
The reddening eye's unsteady glance,—
These are thy marks, Intemperance.

[*The Rubi, a Tale of the Sea.*]

THAT another state of life there must be for every creature wherein there is the breath of life, he was verily persuaded. To that conclusion the whole tenour of his philosophy led him; and what he entertained as a philosophical opinion, acquired from a religious feeling something like the strength of faith. For if the whole of a brute animal's existence ended in this world, then it would follow that there are creatures born into it, for whom it had been better never to have been, than to endure the privations, pains, wrongs and cruelties inflicted upon them by human wickedness; and he would not, could not, dare not, believe, that any, even the meanest of God's creatures, has been created to undergo more of evil than of good, (where no power of choice was given,) much less to suffer unmingled evil, during its allotted term of existence. Yet this must be if there were no state for animals after death.—THE DOCTOR.

USES OF SOME OF THE INORGANIC SUBSTANCES TO MAN.

IF, under the peculiar appointments for man, shelter has been rendered as imperious a necessity as clothing, if substances have been prepared for this purpose, which he has been gifted with ingenuity to apply, and if he has been further provided with intellect to effect this end in a progressively superior manner, which, if had not, he would have been judged less worthy of his Maker's regard than the beaver and the bee, we ought to believe that the means were created for him, even more than the wool of the sheep, since to all other animals they serve no purpose. It is an inconsiderate or a fanatical judgment, which thinks that a Being so great and so powerful could not have attended to such trifles, or which thinks Him insulted by such a supposition. Compared to Himself, what is there worthy of his notice? He who cares for the minutest insect as for man, cannot have judged anything beneath His regard; and if He has provided for the wants of even the living atom which escapes the microscope, it is our duty to believe that He has neglected nothing which could concern our own, infinitely more numerous and complicated as they are, even to the production of a sandstone for building, a limestone for cement, and a slate for roofing.

Is it that associations like these are deemed improper? Let the student of creation accustom himself to think otherwise, else will he fail to discover that the hand of God is in all His works, and learn to neglect Him. Or is it that such attentions are deemed mean, because our own pride, or negligence, or selfishness, prevents us from following those examples of beneficence which He gives us? His ways, indeed, are not as our ways; but were we to endeavour to make our conduct more like His, if only in this, human nature and human life would present far other aspects than they now do. Instead of charging with fanaticism or folly, what may appear vulgar or fanciful attempts to illustrate His goodness, let us rather labour to do as He has done, and equally careless of the ingratitude with which it is received, to persevere in beneficence. Little, indeed, it is that we can effect, but it were well that we even desired to do for each other what He has done from the beginning, and is continually doing for us, ever thoughtless and ever ungrateful.

Are these superfluities, sources of pure pleasure, luxuries, provided for us in these appointments, as in all else? The latter term possesses a vulgar association with what is vicious or forbidden, as do even the former, in minds tinged with ascetitism. But he who would separate pleasures from uses, would require to think more deeply than is usual on such subjects; he who condemns luxury has never thought at all; and he, the acetic, forgets that the beneficence of God has not been limited to the mere supply of needful wants. It is not from him, at least, that reason or religion will take the character of the Universal Father.

In granite, we find a stone so well calculated for durability, so beautiful and various, and so submissive to our tools, that it has been selected from the earliest periods of civilization, as the material for those works which record the power and knowledge of nations. Often, too, their architecture is the only portion of their history which has descended to us: and if it is important for us to know under what forms man has preceded us, what he has thought, known and done, what has been his political condition, what his astronomical knowledge, what his mechanical attainments, what his progress in the arts

of taste, so intimately connected with his general mental cultivation, it is here that we must often seek this information, while thus, also, we often attain to know what his religion has been, under the strange forms which that has assumed. Can we then believe that even the luxury of architecture is unimportant in the eye of the Deity?

And if thoughtlessness should condemn the immense, and apparently useless labours of ancient Egypt, so are they easily condemned, under the use of the ever-acceptable term tyranny, the ever-ready word of him who abuses all the power which he can command. Yet he who would eat must labour: it is the unvarying law, not of God alone, but of human society; the bond by which it is held together. The soil of Egypt was the possession of its singular government, and the labour of the people was the only manner in which they could demand or acquire a share of the produce: it was the only mode in which they ought to have possessed their portions. There is reason to believe that the soil had appropriated all the labour applicable to it; and commercial industry, as it then was, had probably done the same. An artificial invention to occupy labour, became, therefore, imperiously necessary; and through this was Egypt peopled, to an extent which seems to have been very great. The bearing of this fact on other cases, where, under a general law pervading all creation, conditions of labour have been attached to possession, must be obvious: and though tyranny had been the immediate cause, even thus does the Deity often direct the wickedness of man to his own good ends.

Sandstone demands no particular remarks; but had the fissility of slate not been known, it would scarcely have been credited, especially by those who know that it does not occur in consequence of its stratified disposition. That rock was once a solid mass of clay, deposited horizontally, in slow succession, and afterwards indurated. It should have separated into leaves, as the shales do, in the same direction in which it was deposited, if it was to split at all, and there is, therefore, no contingency in the present very different result. The law is a peculiar one; whether intended for the useful end others may judge: it is not, however, the exception which it has been called. Let no one ever perplex or suppress the truth, above all in questions of the present nature. The same law acts in other rocks, but nowhere to the production of so perfect an effect.

The contrivances in the preparations for limestone are much more remarkable than even in the case of coal, and they are acting daily under our eyes, both for present and future purposes. And if animal life here contributes in more than one mode, thus are, ultimately, beneficent ends attained, through means involving a primary mass of beneficence which defies all means of estimate, in the granting of happiness with life to uncountable myriads of beings, through ages which we vainly attempt to conjecture. If it is now superfluous to speak of the uses of this rock in architecture, I may at least note, that they depend on a combination of chemical arrangements which we had no right to expect, and have not long discovered.

It has been among the designs of the Creator, to confer on clay the property of being converted into stone by the aid of heat: while under a variety of appointments in the constitution of these earths, we possess all the uses derived from brick upwards to porcelain. If these varieties are such, that we could not have expected them, from the exceeding simplicity of the composition, so is it remarkable that we must depend on nature for the greater number of them, though possessed of the ingredients, and of the means of analyzing these natural compounds. Every one knows how difficult it has proved to rival the porcelains of China, and that the ancient pottery of Greece is hitherto inimitable.

Indispensable as this property, and the arts derived from it, are to those countries which are deprived of stone, which, nevertheless, from this very cause, their alluvial nature, with their consequent fertility, have been the earliest and most crowded seats of civilized man, so is it in those that the substances in question abound most, as the art of converting them into stone seems coeval with man himself. Still more remarkable may it be considered, that in the most ancient and noted of all inhabited lands, the clay deposited by its great river is convertible into brick by the mere power of the sun, without which peculiar appointment and command Nineveh and Babylon would scarcely have been; while these great cities occupy a space and a time far too important in the history of man, to permit us to doubt that they were ordained,—they, and the very means of their erection and existence. On so apparently insignificant a property in an insignificant earth, the refuse of the mountains, the produce of apparent casualty, the deposit from a river breaking its seemingly appointed bounds, have been founded the greatest and the most powerful, as the most ancient of empires, producing all those extraordinary consequences, which, but for this, would never existed. Can the hand of the Creator be seen in this? Let the reader conclude for himself.

On the variety of arts, the mass of industry, the production of wealth, the uncountable uses consequent on so apparently trivial a substance and simple a property, I need not dwell. Yet I must remark, that to the singular indestructibility of this artificial stone, a property possessed by scarcely any natural work, we owe, as we do to architecture, much historical knowledge that would otherwise have irreparably perished. Hence alone, nearly, is it that we can still trace the great Babylon, perhaps the remains of that very tower, whose history forms so remarkable an era in that of mankind. To this we long owed the only knowledge we had of a perished written language, perhaps of the language used by the earliest races of man. To this also we owe much of what has been rescued for us in the arts of Greece and Etruria; and thus has one of the most apparently frail, as fragile, productions of human art, become the most unexpectedly durable of the records of nations.

[MACCULLOCH's *Proofs and Illustrations of the Attributes of God.*]

THERE is something in beauty, whether it dwells in the human face, in the pencilled leaves of flowers, the sparkling surface of a fountain, or that aspect which genius breathes over its statue, that makes us mourn its ruin. I should not envy that man his feelings who could see a leaf wither or a flower fall, without some sentiment of regret. This tender interest in the beauty and frailty of things around us, is only a slight tribute of becoming grief and affection; for Nature in our adversities never deserts us. She even comes more nearly to us in our sorrows, and leading us away from the paths of disappointment and pain, into her soothing recesses, allays the anguish of our bleeding hearts, binds up the wounds that have been inflicted, whispers the meek pledges of a better hope, and in harmony with a spirit of still holier birth, points to that home where decay and death can never come.—*Constantinople.*

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